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November 12, 2009

Susan M. Hudson, Clerk
Vermont Public Service Board
112 State Street, Drawer 20
Montpelier, VT 05620-2701

RE: Docket No. 7533

Dear Sue,

Please find attached Green Mountain Power Corporation's responses to the 1st Set of Information Requests from the Renewable Energy of Vermont.

Please contact me if you have any questions regarding this submission.

Sincerely,

A handwritten signature in black ink, appearing to read "Joshua Castonguay", written over the word "Sincerely,".

Joshua Castonguay

Cc: electronic service list

**STATE OF VERMONT
PUBLIC SERVICE BOARD**

Investigation into Implementation of)	
Standard Offer Prices for Sustainably)	Docket No. 7533
Priced Energy Enterprise Development)	
("SPEED") Resources)	

RESPONSE OF GREEN MOUNTAIN POWER CORPORATION TO
THE FIRST SET OF DISCOVERY REQUESTS OF
RENEWABLE ENERGY VERMONT

This is the response of Green Mountain Power Corporation ("GMP") to the First Set of Discovery Requests ("Discovery Requests") of Renewable Energy Vermont ("REV"). GMP is filing, electronically, one complete copy of their responses with the Public Service Board ("Board"), with the Vermont Department of Public Service and to each other party of record.

General Objections:

1. GMP objects to the "Instructions" contained in the Discovery Requests to the extent such requests purport to place greater requirements on GMP, or reserve greater rights to REV, than are permitted by the Vermont Rules of Civil Procedure as made applicable to Board proceedings through Board Rule 2.214 (A).
2. GMP objects to any request for information or production of documents that is or are subject to the attorney-client privilege, that constitute work product, that are protected under state or federal law, or that are proprietary, competitively sensitive or confidential.
3. GMP objects to requests to the extent that they (a) are overbroad or unduly burdensome; (b) are cumulative; (c) call for the production of documents not in the possession, custody, or control of GMP or its expert witnesses; (d) call for the review, compilation, or production of publicly available documents that could be obtained by the requesting party in a less burdensome manner; (e) are vague and/or ambiguous; (f) seek information not reasonably calculated to lead to the discovery of admissible evidence; and/or (g) call for the review, compilation, and/or production of a voluminous number of documents at great expense to GMP.
4. GMP does not hereby waive any objections, and does reserve the right to later raise any additional, available objection.

Q1. For each witness for whom GMP has submitted prefiled direct testimony on or about October 30, 2009, please identify and produce all documents prepared by, reviewed by, relied upon and/or used by each witness, or any persons working for or under the direction of each witness, in connection with their testimony, including, but not limited to, the raw data and other results of any research or field work conducted by the person, any notes taken, drafts generated or communications between such person and any other persons regarding such testimony, and any documents, data, research, field work or other information generated by any other person which the witness consulted. Please organize all responsive documents by witness, and for each witness by category based upon the manner in which the files are maintained.

A. Objection. The request seeks privileged work-product. In addition the question is overbroad to the extent it seeks information that is not readily available and therefore would be unduly burdensome to produce. This request also seeks information that is not reasonably calculated to lead to the discovery of admissible evidence. Without waiving the objection, the GMP witness states as follows:

For GMP witness Jason S. Gifford, please refer to the following files, provided electronically:

1. Tracking the Sun II: The Installed Cost of Photovoltaics in the U.S. from 1998-2008. Wiser et al. October 2009 (Lawrence Berkeley National Laboratory)
2. Massachusetts Program Data as of 10-20-09
3. California Program Data as of 10_14_09
4. California 2009 Solar Data
5. California Summary of Data – Completion Data
6. Feed-In Tariff Design Implications for Financing Renewable Energy Projects Over 20 MW
7. Degradation Analysis of Weathered Crystalline-Silicon PV Modules
8. de Jager – Policy Instrument Design to Reduce Risk
9. Dexia Financing 2009 PPT
10. FIT Issues Options CEC-300-2008-003-F
11. GMP Solar Model – Testimony (102909)
12. A second degradation study is available at the following link, which requires a membership to access. However, the results are published in a short abstract on this webpage:
http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=1305189

For GMP witness Joshua Castonguay, please refer to the following files provided electronically:

13. *Building a 'Margin of Safety' into Renewable Energy Procurements: A Review of Experience with Contract Failure* CEC-300-2006-004. Prepared by Ryan Wiser, Ric O'Connell, Mark Bolinger, Robert Grace, and Ryan Pletka under contract to the California Energy Commission. Jan.'06.
14. California Project Contract Failure

GMP witness Douglas Smith, reviewed part or all of the following documents, which are attached in electronic form:

15. A Renewable Supply Technical Report, dated August 2003, prepared for the New York State Energy Research and Development Authority ("NYSERDA").
16. The July 2, 2008 prefiled testimony of Stan Faryniarz regarding an expansion of the Coventry Landfill Gas project.
17. A March, 2008 New York RPS Cost Study Update prepared for NYSERDA (refer to pg 29-131)
18. A March, 2005 presentation by Rachel Goldstein of the US EPA's Landfill Methane Outreach Program ("LMOP").
19. Chapter 4 of LMOP's LFGE Project Development Handbook.
20. Appendix 4-A of LMOP's LFGE Project Development Handbook.
21. A summary of municipal solid waste accepted at Vermont landfills from 2004 to 2008.
22. A December 4, 2008 press release regarding the construction and operation of a 3.2 MW LFG project in DeKalb County, Georgia.
23. A summary of the Calabasas (California) landfill gas generation project.
24. Notes from an October 23, 2009 telephone conversation between Mr. Smith and George Aronson of CRMCMC.

Person Responsible for Response:

Jason Gifford, Consultant Sustainable Energy Advantage, LLC
Joshua Castonguay, Field Operations Lead
Douglas Smith, Manager of Energy Resource Planning & Rates

Date: November 12, 2009

Q2. For each witness for whom the GMP has submitted prefiled direct testimony on or about October 30, 2009, please identify and produce in their original format all electronic files that were utilized or generated to prepare any exhibit or any analysis, images, impressions, conclusions or statements presented in either their prefiled testimony or any associated exhibits..

A. Objection. The request seeks privileged work-product. In addition the question is overbroad to the extent it seeks information that is not readily available and therefore would be unduly burdensome to produce. This request also seeks information that is not reasonably calculated to lead to the discovery of admissible evidence. Without waiving the objection, the GMP witness states as follows:

For GMP Witness Jason S. Gifford, please see response to Q1.

Witness Douglas Smith:

Mr. Smith developed an alternative version of the Cost Analysis Subgroup's spreadsheet cost estimation tool (DPS version) for LFG projects. This alternative version, which is attached in electronic form, was developed by setting the project capital cost equal to \$2,000 per kW, and solving for the levelized cost that would produce the original project internal rate of return. All other assumptions (project O&M, tax rates, etc.) were unadjusted from the DPS values.

Person Responsible for Response:

Jason Gifford, Sustainable Energy Advantage, LLC
Douglas Smith, Manager of Energy Resource Planning & Rates

Date: November 12, 2009

Q3. Regarding [Mr. Gifford's] testimony on page 4, lines 2-10, would you agree that the Lawrence Berkeley report only looked at installed PV costs for 1998-2008, and the reported documented reduction in costs were only for 2007 and 2008?

- a. Please explain how the report provides any indication of the installed costs beyond 2008?**
- b. Would you agree that the report accounts for the reduction in installed costs, at least in part, based on the global financial crisis and increased manufacturing capacity?**
- c. Would you agree that panel demand is an important factor in determining installed costs for PV?**
- d. Would you agree that the report describes a growing number of national, state and local incentives to expand solar markets and increase demand?**

A. The report provides installed cost data for 1998 through 2008. Reductions in installed costs are documented for the periods 1998 through 2005 and from 2007 to 2008.

a. The report provides a preliminary indication that installed costs in 2009 may increase from installed costs in 2008. This indication is based on preliminary installed cost data from California. This testimony, however, analyzes a California dataset of solar projects proposed in 2009, for installation either in late 2009 or early 2010, for which estimated installed costs continue to decline compared to both estimated and actual installed costs in 2008.

b. The report provides the total cost of projects installed during the 1998 through 2008 period. The total costs of projects installed in 2008 may or may not have been impacted by the global financial crisis depending on the date on which the cost of solar equipment, materials and installation services were established by contract. In general, the total cost of projects installed in 2008 would be impacted by the level of manufacturing capacity relative to the level of demand for that equipment at the time the buyer and seller agreed on contractual terms for equipment and installation, which would be at least several months prior to installation. As a result, it appears that the impact of the global financial crisis post-dates, to a substantial degree, the vintage of the data used in the referenced report.

c. Yes.

d. The report summarizes 27 PV incentive programs in 16 states, including Vermont. All programs were established during the 1998 to 2008 period. Twelve of the 27 programs were established in 2005 or later. The report does not state the policy objective of each incentive program.

Person Responsible for Response: Jason Gifford
Title: Consultant, Sustainable Energy Advantage, LLC
Date: November 12, 2009

Q4. Regarding [Mr. Gifford's] testimony on page 4, line 14-15, please clarify what you mean by "projects awarded in California between 2006-2009?" Were all of these projects constructed and/or commissioned? If not, please explain what percentage of the projects have been constructed and commissioned? Does awarded mean the same thing as commissioned??

A. The California dataset includes all projects which have applied for one or more solar program incentives. Based on the data available, 59% of projects applying for state-based incentives have achieved commercial operation, to date. This figure is based on the number of database records with an entry in the "First Completed Date" field divided by the total number of projects which have applied for funding. This value likely understates the ultimate percentage of projects that will achieve commercial operation, however, as there is no information presented to suggest that all of the remaining 41% of projects awarded would fail to be constructed or commissioned.

Person Responsible for Response: Jason Gifford
Title: Consultant, Sustainable Energy Advantage, LLC
Date: November 12, 2009

Q5. Regarding [Mr. Gifford's] testimony on page 4, line 14-15, please clarify what you mean by "projects awarded in California between 2006-2009?" Were all of these projects constructed and/or commissioned? If not, please explain what percentage of the projects have been constructed and commissioned? Does awarded mean the same thing as commissioned??

A. For projects which have achieved commercial operations, the cost data have been updated to show the actual installed costs. For projects which have not yet achieved commercial operations, the cost data show the most recently available estimate of expected installed costs. The majority of 2009 data provide installed cost estimates.

Person Responsible for Response: Jason Gifford
Title: Consultant, Sustainable Energy Advantage, LLC
Date: November 12, 2009

Q6. Regarding [Mr. Gifford's] testimony on pages 4-5, please explain how your analysis of projects in California and Massachusetts predicts costs for plants constructed in 2010? 2011? 2012?

A. The testimony provides an objective analysis of historic data in order to identify installed cost trends that may exist. Neither the testimony nor the underlying analysis predicts the cost of solar projects installed in 2010 and beyond.

Person Responsible for Response: Jason Gifford
Title: Consultant, Sustainable Energy Advantage, LLC
Date: November 12, 2009

Q7. To [Mr. Gifford's] knowledge, is panel manufacturing capacity expected to increase or hold constant as compared to panel manufacturing capacity in 2008 and 2009?

A. The witness has not examined information or projections of global panel manufacturing capacity, and expectations for solar panel manufacturing capacity are not the subject of this testimony. In general, however, panel manufacturing capacity should be expected to respond to future expectations of global panel demand. Such expectations of future demand may vary among market participants.

Person Responsible for Response: Jason Gifford
Title: Consultant, Sustainable Energy Advantage, LLC
Date: November 12, 2009

Q8. Would you agree that if panel demand increases in 2010 and panel manufacturing does not continue to expand, the price for panels is likely to increase in 2010? 2011? Please explain your response.

A. In general I agree that, holding all else constant, the balance of supply and demand can influence market prices. Many other factors would be expected to influence prices for PV panels in the future, including costs of raw material and labor inputs for panels and components, cost of capital, technological advance, expectations of future price trends, industry marginal costs, and strategic pricing decisions of new entrants or vendors of new technologies.

Person Responsible for Response: Jason Gifford
Title: Consultant, Sustainable Energy Advantage, LLC
Date: November 12, 2009

Q9. Please provide the basis for all of the assumptions contained in the table on page 9 of [Mr. Gifford's] testimony and the inclusion of a .5% annual degradation of output.

A. The following provides the basis of each assumption contained in the table on page 9 of the above-referenced testimony. In some cases, the assumptions are unchanged from one or more of the modeling runs conducted in Docket No. 7523. In these cases, the assumptions were provided in the table for the convenience of the parties reading the testimony and the basis, or explanation, refers back to the initial model runs of Docket No. 7523.

Assumption

Basis

Inflation (2.5%): Modeling runs of Power Advisory LLC from September 4, 2009

Debt Service Reserve (4.5 months): This assumption represents the up-front funding (treated as a capitalized cost) of an industry standard 6 months of debt service reserve, adjusted downward to 4.5 months to reflect the expected impact of the increase in revenue certainty associated with a feed-in tariff on a lender's evaluation of the project's revenue risk. The basis for this adjustment is provided by *Feed-In Tariff Design Implications for Financing of Renewable Energy Projects Over 20 MW*, by KEMA, Inc., Deacon Harbor Financial, L.P., Meister Consultants Group, Inc. and Sustainable Energy Advantage, LLC. See slides seven, eight, twelve, 13 through 17, and 20, including the de Jager 2008 reference that "studies have suggested that cost savings of 10 – 30% may be possible from maximizing investor certainty." The presentation version of this report has been provided along with this written response. The California Energy Commission plans to publish the full report on this topic by the end of 2009.

WC/O&M Reserve (6 months): Represents the up-front funding (as a capitalized cost) of an industry standard 3 months of working capital plus 3 months of operating reserves.

Project Life (25 years): REV Recommended Model Input Assumptions for Modeling of PV per Communications of 8/17/09 and 8/18/09.

Debt Tenor (20 years): Feed-in tariffs provide a different regulatory and risk context than has historically been present for the development of renewable energy resources. Feed-in tariffs are designed to identify and mitigate some of the risks traditionally associated with renewable energy development and investment, which include – but are not limited to – long-term revenue

risk (both the availability and price of a long-term agreement), counterparty credit risk and interconnection risk. The result is a relatively lower risk investment than a market without a long-term, cost-based tariff and guaranteed interconnection. In traditional renewable energy project finance markets, a lender would likely determine the size of the non-recourse project loan using an estimate of the cash flow available for debt service and a target average debt service coverage ratio (approximately 1.45X coverage in recent experience in non-feed-in tariff markets). Cash flow available for debt service is highly influenced by the price at which the project's output is sold over the loan tenor. In this historical context, the maximum loan tenor was typically one or two years shorter than the duration of the power purchase agreement (PPA). For example, a 20-year PPA might yield 18-year debt, assuming that all other lender requirements are met. The difference between the PPA term and the debt tenor is referred to as a loan "tail." In the context of a feed-in tariff and the associated reduction in project revenue risk, we have assumed that 20-year debt will be available against 25-year, fixed price PPAs from creditworthy utility-buyers. This loan duration is two years longer than recent average project finance experience supports, but offers a five-year tail which is more than double the recent project finance requirement. The basis for this adjustment is provided by *Feed-In Tariff Design Implications for Financing of Renewable Energy Projects Over 20 MW*, by KEMA, Inc., Deacon Harbor Financial, L.P., Meister Consultants Group, Inc. and Sustainable Energy Advantage, LLC.

Debt/Total Capital (35%): A debt to total capital ratio of 0.35 is intended to represent the conservative assumption that equity investment will cover the approximate portion of total project costs which are recovered through state and federal tax incentives (namely the state and federal investment tax credit and accelerated depreciation). The remaining 35% of the total capital cost will be funded via long-term debt and repaid by the long-term cash benefits generated by the project, which are highly stable based on a fixed price per kWh and an expected quantity of kWhs per year which decreases at only 0.5% year-over-year. In practice, lenders may be more interested in funding to feed-in tariff projects at debt-to-total capital ratios of 0.5 or higher.

Cost of Debt (7%): The price, duration and credit certainty associated with a feed-in tariff with a utility-buyer may allow for new, standardized financing models to evolve which were not

feasible in a traditional PPA and project finance regime. To this end, we assume that the cost of debt associated with financing a feed-in tariff project will reside on the lower end of the scale of recent industry experience. Further, regional and local banks may find renewable energy projects supported by feed-in tariffs to be an ideal entry-point into renewable energy investing, compared to the risk and return profile of alternative investments.

Net Capacity Factor (13.5%): The source for Net Capacity Factor is PV Watts, Version 1. Standard PV Watts assumptions for tilt and azimuth on a fixed tilt system were applied. The result was rounded to the nearest one half of one percent. PV Watts is publicly available at: http://rredc.nrel.gov/solar/codes_algs/PVWATTS/version1/

Project Size (500 kW): The example project was sized to be consistent with the largest commercially available inverter.

Total Project Cost (\$5,000/kW): The total project cost assumption is based on the group of CA solar projects – proposed in 2009 – with the lowest average estimated total installed cost. In this case, the average total cost is based on projects between 300 and 400 kW.

Inverter Replacement, year 12 (\$270/kW): REV Recommended Model Input Assumptions for Modeling of PV per Communications of 8/17/09 and 8/18/09.

O&M (\$6/kW): REV Recommended Model Input Assumptions for Modeling of PV per Communications of 8/17/09 and 8/18/09.

Property Tax (1% of total cost): Modeling runs of Power Advisory LLC from September 4, 2009

Insurance (\$25,000/MW/Year): REV Recommended Model Input Assumptions for Modeling of PV per Communications of 8/17/09 and 8/18/09.

With respect to the inclusion of a 0.5% annual degradation factor, this industry standard modeling practice is typically based on one of two approaches. One option is to rely on the performance guarantees provided by some panel manufacturers, which may warrant that the system's kWh production will be at least 90% of the output at standard test conditions after 10 years of operation, and at least 80% of output at standard test conditions after 25 years. This is the equivalent of approximately 1% annual degradation rate. The second option is to rely on two

studies published by the National Renewable Energy Laboratory (NREL): (1) "Degradation Analysis of Weathered Crystalline-Silicon PV Modules", published by NREL in 2002, and its successor study, (2) "Degradation in Weathered Crystalline-Silicon PV Modules Apparently Caused by UV Radiation," published in 2003. The first study indicates an average degradation rate of 0.71%; the second indicates an expected degradation rate of 0.2%-0.5%. Based on these studies, the testimony assumes a mid-range estimated degradation of 0.5%.

Person Responsible for Response: Jason Gifford
Title: Consultant, Sustainable Energy Advantage, LLC
Date: November 12, 2009

Q10. Regarding your testimony on page 10, what is the basis of your opinion that 161 MW worth of applications “strongly suggests” that the \$.30/kWh price incentivizes far more than the most cost-effective Vermont solar projects?

a. Applications for how many MW worth of project would lead you to believe that the price was set correctly to incentivize the most cost-effective Vermont solar projects?

A. Both the volume and range of proposed project sizes provides empirical evidence that \$.30 per kWh is an attractive price for projects as small as 2 kW and as large as 2200 kW. Based on publicly available data, it is reasonable to conclude that some economies of scale exist for solar electric projects. If such economies of scale do exist, the fact that projects covering the range of sizes from 2 kW to 2200 kW have entered the queue to receive standard contracts at \$.30 per kWh for 25 years strongly suggests that within this range, the larger projects have a lower per-kWh revenue requirement to attract investment than the smaller projects. While some attrition is inevitable based on industry experience (please refer to the response to Interrogatory #13), if \$.30 per kWh is sufficient to attract investment in a wide range of project sizes including very small projects, it is reasonable to surmise that the more cost-effective of the range or projects that benefit from the relative economies of scale will stand to earn greater than the threshold return required to attract investment.

a. The appropriate standard offer rate is one which accomplishes the state’s policy objectives. In this case, the policy objectives suggest a standard offer rate which approximates the levelized cost of energy from solar projects which capture economies of scale and other efficiencies which may be related to financing, interconnection, operation and other factors. The optimal standard offer rate would generate applications for a quantity of installed capacity which enables the state to achieve its policy targets after taking into account the level of contract failure experienced throughout the industry (see response to question #13). While many of the causes of contract failure, such as transmission constraints and permitting delays, are not applicable to PV installations below 2200 kW, it is nonetheless reasonable to set a price which anticipates some level of project attrition.

Docket 7533
In Re SPEED Resources
Responses of Green Mountain Power Corporation to
REV First Set of Discovery Questions

Person Responsible for Response: Jason Gifford
Title: Consultant, Sustainable Energy Advantage, LLC
Date: November 12, 2009

Q11. Regarding [Mr. Castonguay's] testimony on page 3, lines 12-14, please explain what you mean by "economically viable" projects?

A. In this context, the term "economically viable" refers to projects that will receive the required rate of return at the Standard Offer price that is being proposed. The overall point of this testimony is to state that GMP is not discouraging smaller projects, but that the Board set the rate based on larger project assumptions. Based on SEA's analysis and assumptions, we propose that the rate be set no higher than 26 cents/kWh for Solar PV.

Person Responsible for Response: Joshua P. Castonguay
Title: Field Operations Lead
Date: November 12, 2009

Q12. Regarding [Mr. Castonguay's] testimony on page 4, lines 1-2, please clarify the date range for which the "data now available clearly demonstrate a measurable and defensible cost reduction." If the data range you provide extends past November 2009, please provide the basis for your projection?

A. The California data spans the period from 2006 through October 15, 2009.

Person Responsible for Response: Joshua P. Castonguay
Title: Field Operations Leads
Date: November 12, 2009

Q13. Regarding [Mr. Castonguay's] testimony on page 4, lines 12-17, please explain the basis for your opinion that your review of projects in other states "underscores the inevitability of project attrition."

- a. Please explain what you mean by project attrition.**
- b. What is the basis for your opinion that a portion of the projects in the queue will fail to achieve commercial operation? In your opinion, what are the reasons why a project in the queue may fail to achieve commercial operation??**

A. There are multiple factors leading to this opinion. First, GMP is often approached by renewable and non-renewable generation project developers at varying stages of development. GMP estimates that approximately 90% of these projects are never completed. Some of these proposed projects have financing in place, and the developer's economic models suggest that the project is economically viable and nevertheless do not end up being commissioned. The projects in Standard Offer will have 3 years to be commissioned, and will need to receive a Certificate of Public Good under the Section 248 process. It is possible that some of these projects to be unable to meet all the criteria set forth in 30 V.S.A. §248, and therefore, will not receive a Certificate of Public Good. These failed projects would subsequently be removed from the queue, allowing replacement project(s) to take their place. Second, GMP has obtained a 2006 report discussing the inevitability of a certain amount of project contract failure. This report is included as one of the data items in this discovery response, and concludes that a minimum overall failure rate of 20 percent to 30 percent, and in many cases substantially higher, should generally be expected for large solicitations conducted over multiple years. Some of the primary causes of contract failure in North American utility solicitations include siting and permitting challenges; developer financing difficulties; capital cost increases; and transmission and interconnection issues.

a. In this context, project attrition means the reduction, in the number of projects currently in the queue, for one or more reasons such as the failure to meet contract obligations, secure financing or other factors.

b. As explained in the answer above, GMP has first-hand experience of generation projects being proposed, but never reaching operational status. We have also seen projects fail because they have not received a Certificate of Public Good. There are many factors in bringing a renewable generation project online, not the least of which is fulfillment of all Section 248 criteria.

Person Responsible for Response: Joshua P. Castonguay
Title: Field Operations Lead
Date: November 12, 2009

Q14. Regarding [Mr. Castonguay's] testimony on page 5, line 10, what is the basis for your assumption to include a 1.27 debt service coverage ratio?

A. This is simply an output of the cost model, based on the assumptions used in the model. The model is provided as Attachment REV:GMP 1-14.

Person Responsible for Response: Joshua P. Castonguay
Title: Field Operations Lead
Date: November 12, 2009

Docket 7533
In Re SPEED Resources
Responses of Green Mountain Power Corporation to
REV First Set of Discovery Questions

As to Objections:

A handwritten signature in cursive script, appearing to read "B Marks", written over a horizontal line.

Benjamin Marks, Esq.
SHEEHEY FURLONG & BEHM P.C.
30 Main Street
PO Box 66
Burlington, VT 05402